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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/530,475	04/06/2005	Masahide Kwaraya	050179	4981

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WASHINGTON, DC 20006

EXAMINER
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BRYANT, DELORIS S

ART UNIT	PAPER NUMBER
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2813

DATE MAILED: 05/02/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/530,475

Applicant(s)

KAWARAYA ET AL.

Examiner

Deloris Bryant

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 06 April 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 4/6/05.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1, 4-7, 9-10 and 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akui et al (US 2002/0042342) in view of Choi et al (US 2005/0150545). Akui discloses a process of forming a semiconductor film, comprising the steps of: applying a semiconductor particle dispersion liquid to a substrate surface (para. 0009 and 0021) and drying the coating to form a porous semiconductor film (para. 0038). Akui fails to disclose the dispersion liquid discharged from the spray coater have a mean diameter of 30  $\mu\text{m}$  or less. Choi does disclose the use of a spray coater (para 0052) and a range for the mean particle diameter (para. 0050). It would have been obvious to a person skilled in the art at the time of the invention to incorporate the use of a spray coater that Choi discloses with that of Akui. One would

have been motivated to so modify Akui to prevent a larger diameter, which means surface area is reduced and photoelectric conversion efficiency is decreased.

Regarding claim 4, Akui and Choi teaches the limitations set forth in claim 1 above. Furthermore, Choi discloses wherein the semiconductor particle dispersion liquid is a dispersion in methanol and/or ethanol of particles of at least one semiconductor selected from the group consisting of metal oxides, perovskites, metal sulfides and metal chalcogenides (pg. 5, para 0077).

Regarding claim 5, Akui and Choi teach the limitations as set forth above. Furthermore, Choi discloses wherein the semiconductor particles are titanium oxide particles (para. 0076).

Regarding claim 6, Akui and Choi teach the limitations as set forth above. Furthermore, Choi discloses wherein the titanium oxide particles are anatase-type titanium oxide particles (para. 0087).

Regarding claim 7, Akui and Choi teach the limitations as set forth above. Furthermore, Choi discloses wherein the semiconductor particle dispersion liquid has a solids content of about 1 wt.% to about 40 wt.% (para. 0087).

Regarding claim 9, Akui and Choi teach the limitations as set forth above. Furthermore, Choi discloses wherein the atomized droplets of the dispersion liquid discharged from the spray coater have a mean diameter of about 1  $\mu\text{m}$  to about 25  $\mu\text{m}$ . It would have been obvious to a person skilled in the art at the time of the invention to incorporate the disclosure of Choi with that of Akui. One would have been motivated to

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so modify Akui to prevent a larger diameter, which means surface area is reduced and photoelectric conversion efficiency is decreased.

Regarding claim 10, Akui and Choi teach the limitations as set forth above. Furthermore, Choi discloses wherein the coating is dried by heating at a temperature of about 200C or lower or by irradiation with electromagnetic waves. It would have been obvious to a person skilled in the art at the time of the invention to incorporate the drying method of Choi in order to convert TiO into anatase TiO by calcinations.

Regarding claim 12-14, Akui and Choi teach the limitations as set forth above. Furthermore, Akui discloses a photocatalyst comprising a porous semiconductor film formed on a substrate (para. 0023) (claim 12); wherein the porous semiconductor film is a porous titanium oxide film (para. 0023) (claim 13) and wherein the porous titanium oxide film is a porous anatase-type titanium oxide film (para 0024) (claim 14). It would have been obvious to a person skilled in the art at the time of the invention to incorporate the disclosure of Akui so that the film has good adhesion and to improve the photocatalytic activities of TiO.

Claims 2-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akui et al (US 2002/0042342) in view of Choi et al (US 2005/0150545) and in further view of Arakawa et al (US 6,228,796). Akui and Choi teach the limitations as set forth above but fails to disclose wherein the substrate is a thermoplastic resin substrate (claim 2) and that the thermoplastic resin substrate is a high polymer film (claim 3). Arakawa, however, does disclose a thermoplastic resin is a high polymer film (col. 3, Ins 6-65). It

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would have been obvious to a person skilled in the art at the time of the invention to incorporate the teachings of Arakawa with that of Akui and Choi. One would have been motivated to modify Akui and Choi because thermoplastic resin is a preferred material not only due to its high performance as an insulator, withstanding temperatures of up to 400°C, but also because it is light-weight and easy to shape.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Akui et al (US 2002/0042342) in view of Choi et al (US 2005/0150545) and in further view of Toyomura et al (US 2004/0159102). Akui and Choi teach the limitations as set forth above but fail to disclose wherein the semiconductor particle dispersion liquid has a viscosity of about 0.001 Pa/sec to about 2 Pa/sec. Toyomura does teach having a within this range (para. 0016-0017). It would have been obvious to a person skilled in the art at the time of the invention to incorporate the teachings of Toyomura with that of Akui and Choi to improve productivity. One would have been motivated to modify Akui and Choi because as the viscosity decreases, a plurality of coats are required to form the desired thickness, and therefore it is actually preferred to have a viscosity of 0.001 PaS or more to reduce the number of coats necessary for coverage.

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Akui et al (US 2002/0042342) in view of Choi et al (US 2005/0150545) and in further view of Kawazu et al (US 2002/0186469). Akui and Choi teach the limitations as set forth above but fail to disclose wherein the coating is dried by microwave irradiation.

Kawazu, however, does teach drying with irradiation (para. 0014). It would have been obvious to a person skilled in the art at the time of the invention to incorporate the teachings of Kawazu with that of Akui and Choi, which will result in the formation of a fine metal particle dispersed film.

Claims 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fukui et al (US 2004/0221888) in view of Akui et al (US 2002/0042342) and Choi et al (US 2005/0150545). Fukui discloses an electrically conductive transparent layer formed on either a glass plate or a transparent high polymer film (para. 0026-0027). Fukui fails to teach a porous semiconductor film formed by the process of claim 1. Akui does teach a porous semiconductor film (para. 0024 and 0038). It would have been obvious to a person skilled in the art at the time of the invention to incorporate the porous semiconductor film of Akui with that of Fukui, Akui and Choi so that the film has good adhesion and as a result is difficult to peel off.

Regarding claim 16-17, Fukui, Akui and Choi teach the limitations as set forth above. Furthermore, Akui discloses the porous semiconductor film is a porous titanium oxide film (para. 0023) (claim 16) and wherein the porous titanium oxide film is a porous anatase-type titanium oxide film (para 0024) (claim 17). It would have been obvious to a person skilled in the art at the time of the invention to incorporate the anatase-type titanium oxide film of Akui with the teachings of Fukui, Akui and Choi so that the film has good adhesion and to improve the photocatalytic activities of TiO<sub>2</sub>.

**Conclusion**


The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Deloris Bryant whose telephone number is (571) 272-8670. The examiner can normally be reached on M-F 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

dsb

  
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